In the Claims

1. (Original) A method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

(a) determining a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels;

(b) determining an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels;

(c) determining a transfer control function based on the determined illumination intensity level mapping function; and

(d) imposing the determined transfer control function upon a pixel of the digital imager.

2. (Original) The method as claimed in claim 1, further comprising:

(e) determining a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels; and

(f) determining an integration time based upon the determined number of pixels having illumination intensity levels within a second defined range of illumination intensity levels;

said determination of the transfer control function being determined based on the determined illumination intensity level mapping function and the determined integration time.

3. (Original) The method as claimed in claim 1, wherein (a) – (d) are repeated until a desired dynamic range is realized.

4. (Original) The method as claimed in claim 1, wherein the first defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing pixel saturation.

5. (Original) The method as claimed in claim 2, wherein the second defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level.

6. (Original) The method as claimed in claim 2, wherein the first defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing pixel saturation and the second defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level adjusted for a pixel offset value.

7. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a frame of pixels of image data created by the digital imager.

8. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a partial frame of pixels of image data created by the digital imager.

9. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a defined area within a frame of pixels of image data created by the digital imager.

10. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a user-defined area within a frame of pixels of image data created by the digital imager.

11. (Original) The method as claimed in claim 1, wherein the determined illumination intensity level mapping function is a calculated illumination intensity level mapping function, the calculation being based upon the determined number of pixels within the first defined range of illumination intensity levels.

12. (Original) The method as claimed in claim 1, wherein the determined illumination intensity level mapping function is a selected illumination intensity level mapping function selected from a plurality of pre-specified illumination intensity level mapping functions, the selection being based upon the determined number of pixels within the first defined range of illumination intensity levels.

13. (Original) The method as claimed in claim 1, wherein the determined transfer control function is a calculated transfer control function, the calculation being based upon the determined illumination intensity level mapping function.

14. (Original) The method as claimed in claim 1, wherein the determined transfer control function is a selected transfer control function from a plurality of pre-specified transfer control functions, the selection being based upon the determined illumination intensity level mapping function.

15. (Original) The method as claimed in claim 2, wherein the determined transfer control function is a calculated transfer control function, the calculation being based upon the determined illumination intensity level mapping function and determined integration time.

16. (Original) The method as claimed in claim 2, wherein the determined transfer control function is a selected transfer control function from a plurality of pre-specified transfer control functions, the selection being based upon the determined illumination intensity level mapping function and determined integration time.

17. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination

intensity levels within a first defined range of illumination intensity levels during a period of time that the digital imager is creating a second frame of pixels;

said determination of an illumination intensity level mapping function determines an illumination intensity level mapping function based upon the determined number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels during the period of time that the digital imager is creating the second frame of pixels; and

said imposition of the determined transfer control function imposes the determined transfer control function upon a pixel of the digital imager during a third frame of pixels of image data being created by the digital imager.

18. (Original) The method as claimed in claim 1, wherein said determination of a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels during a period of time that the digital imager is creating a first frame of pixels;

said determination of an illumination intensity level mapping function determines an illumination intensity level mapping function based upon the determined number of pixels of image data having intensity levels within a first defined range of intensity levels during the period of time that the digital imager is creating the first frame of pixels; and

said imposition of the determined transfer control function imposes the determined transfer control function upon a pixel of the digital imager during a second frame of pixels of image data being created by the digital imager.

19. (Original) The method as claimed in claim 2, wherein the illumination intensity level mapping function is determined independently of the determination of the integration time.

20. (Original) The method as claimed in claim 2, wherein the determinations of the illumination intensity level mapping function and integration time are dependent thereupon.

21. (Original) The method as claimed in claim 2, wherein the illumination intensity level mapping function is determined prior to the determination of the integration time.

22. (Original) The method as claimed in claim 2, wherein the illumination intensity level mapping function is determined after the determination of the integration time.

23. (Original) The method as claimed in claim 2, wherein determinations of the illumination intensity level mapping function and the integration time are determined substantially simultaneously.

24. (Original) The method as claimed in claim 12, wherein the number of illumination intensity level mapping functions to select from is eight.

25. (Original) The method as claimed in claim 1, further comprising:

(d) determining, for each of a plurality of defined ranges of illumination intensity levels, a number of pixels within the defined range of illumination intensity levels when the determined number of pixels within the first defined range of illumination intensity levels is above a first threshold; and

(e) determining, for each defined range of illumination intensity levels, an illumination intensity level mapping function based upon the determined number of pixels within the defined ranges of illumination intensity levels.

26. (Original) A method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

(a) determining a plurality of numbers of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels;

(b) determining a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels;

(c) determining a transfer control function based on the plurality of determined illumination intensity level mapping functions; and

(d) imposing the determined transfer control function upon a pixel of the digital imager.

27. (Original) The method as claimed in claim 26, further comprising:

(e) determining a number of pixels having illumination intensity levels within a specified range of illumination intensity levels; and

(f) determining an integration time based upon the determined number of pixels having illumination intensity levels within a specified range of illumination intensity levels;

said determination of the transfer control function being determined based on the plurality of determined illumination intensity level mapping functions and the determined integration time.

28. (Original) The method as claimed in claim 26, wherein (a) - (d) are repeated until a desired dynamic range is realized.

29. (Original) The method as claimed in claim 27, wherein the specified range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level.

30. (Original) The method as claimed in claim 27, wherein the specified range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level adjusted for a pixel offset value.

31. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined range of illumination intensity levels from a frame of pixels of image data created by the digital imager.

32. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined

range of illumination intensity levels from a partial frame of pixels of image data created by the digital imager.

33. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined range of illumination intensity levels from a defined area within a frame of pixels of image data created by the digital imager.

34. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined range of illumination intensity levels from a user-defined area within a frame of pixels of image data created by the digital imager.

35. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined range of illumination intensity levels during a period of time that the digital imager is creating a second frame of pixels;

said determination of a plurality of illumination intensity level mapping function determining each illumination intensity level mapping function corresponding to one of the defined ranges of illumination intensity levels during the period of time that the digital imager is creating the second frame of pixels; and

said imposition of the determined transfer control function imposes the determined transfer control function upon a pixel of the digital imager during a third frame of pixels of image data created by the digital imager.

36. (Original) The method as claimed in claim 26, wherein said determination of a plurality of numbers of pixels determines each number of pixels corresponding to one defined range of illumination intensity levels during a period of time that the digital imager is creating a first frame of pixels;

said determination of a plurality of illumination intensity level mapping function determining each illumination intensity level mapping function corresponding to one of the

defined ranges of illumination intensity levels during the period of time that the digital imager is creating the first frame of pixels; and

said imposition of the determined transfer control function imposes the determined transfer control function upon a pixel of the digital imager during a second frame of pixels of image data created by the digital imager.

37. (Original) A method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

(a) determining a number of saturated pixels;

(b) selecting a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold;

(c) determining a number of pixels having illumination intensity levels within a defined range of values;

(d) selecting a second illumination intensity level mapping function when the determined number of pixels is below a second threshold;

(e) determining a transfer control function based on the selected illumination intensity level mapping function; and

(f) imposing the determined transfer control function upon a pixel of the digital imager.

38. (Original) The method as claimed in claim 37, wherein the first illumination intensity level mapping function represents a greater compression of the resolution of the high illumination intensity levels of the scene than the second illumination intensity level mapping function.

39. (Original) The method as claimed in claim 37, wherein said determination of the number of pixels having illumination intensity levels within a defined range of values determines the number of pixels when the determined number of saturated pixels is below a first threshold.

40. (Original) The method as claimed in claim 37, further comprising:

(g) determining a number of pixels having illumination intensity levels within a specified range of illumination intensity levels; and

(h) determining an integration time based upon the determined number of pixels having illumination intensity levels within a specified range of illumination intensity levels;

said determination of the transfer control function being determined based on the selected illumination intensity level mapping function and the determined integration time.

41. (Original) A method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

(a) determining a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value;

(b) determining an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels;

(c) determining a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level;

(d) determining an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels;

(e) determining a transfer control function based on the determined illumination intensity level mapping function and the determined integration time; and

(f) imposing the determined transfer control function upon a pixel of the digital imager.

42. (Original) The method as claimed in claim 41, wherein the transfer control function comprises a plurality of discrete transfer control functions.

43. (Original) The method as claimed in claim 41, wherein the transfer control function comprises eight discrete transfer control functions.

44. (Original) The method as claimed in claim 43, wherein the determined illumination intensity level mapping function comprises a plurality of discrete illumination intensity level mapping functions.

45. (Original) The method as claimed in claim 43, wherein the determined illumination intensity level mapping function comprises eight discrete illumination intensity level mapping functions.

46. (Original) The method as claimed in claim 44, wherein each discrete transfer control function is determined based on one of the plurality of distinct illumination intensity level mapping functions.

47. (Original) The method as claimed in claim 45, wherein each discrete transfer control function is determined based on one of the eight distinct illumination intensity level mapping functions.

48. (Original) The method as claimed in claim 44, wherein each discrete illumination intensity level mapping function is a linear illumination intensity level mapping function.

49. (Original) The method as claimed in claim 45, wherein each discrete illumination intensity level mapping function is a linear illumination intensity level mapping function.

50. (Original) The method as claimed in claim 48, wherein the plurality of discrete linear illumination intensity level mapping functions form a composite piece-wise linear illumination intensity level mapping function, the composite piece-wise linear compression being the determined illumination intensity level mapping function, the determined illumination intensity level mapping function being a nearly logarithmic illumination intensity level mapping function.

51. (Original) The method as claimed in claim 49, wherein the eight discrete linear illumination intensity level mapping functions form a composite piece-wise linear illumination intensity level mapping function, the composite piece-wise linear compression being the determined illumination intensity level mapping function, the determined illumination intensity level mapping function being a nearly logarithmic illumination intensity level mapping function.

52. (Original) A method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

(a) selecting a first illumination intensity level mapping function;

(b) determining a first transfer control function based on the selected first compression;

(c) imposing the determined first transfer control function upon a pixel of the digital imager;

(d) determining a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon;

(e) determining an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram;

(f) determining a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager;

(g) determining a second transfer control function based on the determined second illumination intensity level mapping function; and

(h) imposing the determined second transfer control function upon a pixel of the digital imager.

53. (Original) The method as claimed in claim 52, wherein the first illumination intensity level mapping function represents a greater compression of the resolution of the high illumination intensity levels of the scene than the second illumination intensity level mapping function.

54. (Original) A method for determining transition points between a plurality of discrete transfer control functions forming a composite transfer control function, comprising:

(a) determining an integration time;

(b) determining an illumination intensity level mapping function;

(c) determining a composite transfer control function based on the determined integration time and determined illumination intensity level mapping function; and

(d) determining each transition point between a plurality of discrete transfer control functions from the determined integration time and the determined illumination intensity level mapping function.

55. (Original) The method as claimed in claim 54, wherein the composite transfer control function has eight discrete transfer control functions and seven transition points.

56. (Original) The method as claimed in claim 54, wherein a first transition point is equal to a difference between a maximum possible integration time and the determined integration time.

57. (Original) The method as claimed in claim 54, wherein a first transition point is equal to a difference between a possible maximum integration time and the determined integration time and a subsequent transition point is equal to a sum of all previous barrier break points and a time T_s where

T_s is equal to $((g^{n-1})/((g^{n-1}+g^{n-2}+\ldots+g^2+g+2)(g^{(p)})))*T_{int}$,

g is equal to the determined illumination intensity level mapping function,

n is equal to a total number of transition points,

p is equal to a positional number of the discrete transfer control function being calculated, and

T_{int} is equal to the determined integration time.

58. (Original) The method as claimed in claim 55, wherein a first transition point is equal to a difference between a possible maximum integration time and the determined integration time and a subsequent transition point is equal to a sum of all previous barrier break points and a time T_s where

T_s is equal to $((g^{n-1})/((g^{n-1}+g^{n-2}+\ldots+g^2+g+2)(g^{(p)})))*T_{int}$,

g is equal to the determined illumination intensity level mapping function,

n is equal to a total number of transition points,

p is equal to a positional number of the discrete transfer control function being calculated, and

T_{int} is equal to the determined integration time.

59. (Original) A system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; and

a transfer control function generation circuit, operatively connected to the digital imager and said illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

60. (Original) The system as claimed in claim 59, further comprising:

an exposure controller, operatively connected to the digital imager and said transfer control function generation circuit, to determine a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels and to determine an integration time based upon the determined number of pixels having illumination intensity levels within a second defined range of illumination intensity levels;

said transfer control function generation circuit determining said transfer control function based on the determined illumination intensity level mapping function and the determined integration time.

61. (Original) The system as claimed in claim 59, wherein the first defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing pixel saturation.

62. (Original) The system as claimed in claim 60, wherein the second defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level.

63. (Original) The system as claimed in claim 60, wherein the first defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing pixel saturation and the second defined range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level adjusted for a pixel offset value.

64. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a frame of pixels of image data created by the digital imager.

65. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a partial frame of pixels of image data created by the digital imager.

66. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a defined area within a frame of pixels of image data created by the digital imager.

67. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels from a user-defined area within a frame of pixels of image data created by the digital imager.

68. (Original) The system as claimed in claim 59, wherein the determined illumination intensity level mapping function is a calculated illumination intensity level mapping function,

the calculation being based upon the determined number of pixels within the first defined range of illumination intensity levels.

69. (Original) The system as claimed in claim 59, wherein the determined illumination intensity level mapping function is a selected illumination intensity level mapping function selected from a plurality of pre-specified illumination intensity level mapping functions, the selection being based upon the determined number of pixels within the first defined range of illumination intensity levels.

70. (Original) The system as claimed in claim 59, wherein the determined transfer control function is a calculated transfer control function, the calculation being based upon the determined illumination intensity level mapping function.

71. (Original) The system as claimed in claim 59, wherein the determined transfer control function is a selected transfer control function from a plurality of pre-specified transfer control functions, the selection being based upon the determined illumination intensity level mapping function.

72. (Original) The system as claimed in claim 60, wherein the determined transfer control function is a calculated transfer control function, the calculation being based upon the determined illumination intensity level mapping function and determined integration time.

73. (Original) The system as claimed in claim 60, wherein the determined transfer control function is a selected transfer control function from a plurality of pre-specified transfer control functions, the selection being based upon the determined illumination intensity level mapping function and determined integration time.

74. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels during a period of time that the digital imager is creating a second frame of pixels;

said illumination intensity level mapping controller determines the illumination intensity level mapping function based upon the determined number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels during the period of time that the digital imager is creating the second frame of pixels; and

said transfer control function generation circuit imposes the determined transfer control function upon a pixel of the digital imager during a third frame of pixels of image data being created by the digital imager.

75. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels during a period of time that the digital imager is creating a first frame of pixels;

said illumination intensity level mapping controller determines the illumination intensity level mapping function based upon the determined number of pixels of image data having intensity levels within a first defined range of intensity levels during the period of time that the digital imager is creating the first frame of pixels; and

said transfer control function generation circuit imposes the determined transfer control function upon a pixel of the digital imager during a second frame of pixels of image data being created by the digital imager.

76. (Original) The system as claimed in claim 60, wherein the illumination intensity level mapping function is determined independently of the determination of the integration time.

77. (Original) The system as claimed in claim 60, wherein the determinations of the illumination intensity level mapping function and integration time are dependent thereupon.

78. (Original) The system as claimed in claim 60, wherein the illumination intensity level mapping function is determined prior to the determination of the integration time.

79. (Original) The system as claimed in claim 60, wherein the illumination intensity level mapping function is determined after the determination of the integration time.

80. (Original) The system as claimed in claim 60, wherein determinations of the illumination intensity level mapping function and the integration time are determined substantially simultaneously.

81. (Original) The system as claimed in claim 59, wherein said illumination intensity level mapping controller determines, for each of a plurality of defined ranges of illumination intensity levels, a number of pixels within the defined range of illumination intensity levels when the determined number of pixels within the first defined range of illumination intensity levels is above a first threshold;

said illumination intensity level mapping controller determines, for each defined range of illumination intensity levels, an illumination intensity level mapping function based upon the determined number of pixels within the defined ranges of illumination intensity levels.

82. (Original) A system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a plurality of number of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels and to determine a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels; and

a transfer control function generation circuit, operatively connected to the digital imager and said illumination intensity level mapping controller, to determine a transfer control function based on the plurality of determined illumination intensity level mapping functions and to impose the determined transfer control function upon a pixel of the digital imager.

83. (Original) The system as claimed in claim 82, further comprising:

an exposure controller, operatively connected to the digital imager and said transfer control function generation circuit, to determine a number of pixels having illumination

intensity levels within a specified range of illumination intensity levels and to determine an integration time based upon the determined number of pixels having illumination intensity levels within a specified range of illumination intensity levels;

said transfer control function generation circuit determining said transfer control function based on the plurality of determined illumination intensity level mapping functions and the determined integration time.

84. (Original) The system as claimed in claim 83, wherein the specified range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level.

85. (Original) The system as claimed in claim 83, wherein the specified range of illumination intensity levels is a range of illumination intensity levels including an illumination intensity level representing a minimum illumination intensity level adjusted for a pixel offset value.

86. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels from a frame of pixels of image data created by the digital imager.

87. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels from a partial frame of pixels of image data created by the digital imager.

88. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels from a defined area within a frame of pixels of image data created by the digital imager.

89. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels from a user-defined area within a frame of pixels of image data created by the digital imager.

90. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels during a period of time that the digital imager is creating a second frame of pixels;

said illumination intensity level mapping controller determines each illumination intensity level mapping function corresponding to one of the defined ranges of illumination intensity levels during the period of time that the digital imager is creating the second frame of pixels; and

said transfer control function generation circuit imposes the determined transfer control function upon a pixel of the digital imager during a third frame of pixels of image data created by the digital imager.

91. (Original) The system as claimed in claim 82, wherein said illumination intensity level mapping controller determines each number of pixels corresponding to one defined range of illumination intensity levels during a period of time that the digital imager is creating a first frame of pixels;

said illumination intensity level mapping controller determines each illumination intensity level mapping function corresponding to one of the defined ranges of illumination intensity levels during the period of time that the digital imager is creating the first frame of pixels; and

said transfer control function generation circuit imposes the determined transfer control function upon a pixel of the digital imager during a second frame of pixels of image data created by the digital imager.

92. (Original) A system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of saturated pixels and to select a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold;

said illumination intensity level mapping controller determining an number of pixels having illumination intensity levels within a defined range of values and selecting a second illumination intensity level mapping function when the determined number of pixels is below a second threshold; and

a transfer control function generation circuit, operatively connected to the digital imager and said illumination intensity level mapping controller, to determine a transfer control function based on the selected illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

93. (Original) The system as claimed in claim 92, wherein the first illumination intensity level mapping function represents a greater compression of the resolution of the high illumination intensity levels of the scene than the second illumination intensity level mapping function.

94. (Original) The system as claimed in claim 92, wherein said illumination intensity level mapping controller determines the number of pixels when the determined number of saturated pixels is below a first threshold.

95. (Original) The system as claimed in claim 92, further comprising:

an exposure controller, operatively connected to the digital imager and said transfer control function generation circuit, to determine a number of pixels having illumination intensity levels within a specified range of illumination intensity levels and to determine an integration time based upon the determined number of pixels having illumination intensity levels within a specified range of illumination intensity levels;

said transfer control function generation circuit determining the transfer control function based on the selected illumination intensity level mapping function and the determined integration time.

96. (Original) A system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value, and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels;

an exposure controller, operatively connected to the digital imager, to determine a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level, and to determine an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels; and

a transfer control function generation circuit, operatively connected to the digital imager, said exposure controller and said illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and the determined integration time and to impose the determined transfer control function upon a pixel of the digital imager.

97. (Original) The system as claimed in claim 96, wherein the transfer control function comprises a plurality of discrete transfer control functions.

98. (Original) The system as claimed in claim 96, wherein the transfer control function comprises eight discrete transfer control functions.

99. (Original) The system as claimed in claim 97, wherein the determined illumination intensity level mapping function comprises a plurality of discrete illumination intensity level mapping functions.

100. (Original) The system as claimed in claim 98, wherein the determined illumination intensity level mapping function comprises eight discrete illumination intensity level mapping functions.

101. (Original) The system as claimed in claim 99, wherein each discrete transfer control function is determined based on one of the plurality of distinct illumination intensity level mapping functions.

102. (Original) The system as claimed in claim 100, wherein each discrete transfer control function is determined based on one of the eight distinct illumination intensity level mapping functions.

103. (Original) The system as claimed in claim 99, wherein each discrete illumination intensity level mapping function is a linear illumination intensity level mapping function.

104. (Original) The system as claimed in claim 100, wherein each discrete illumination intensity level mapping function is a linear illumination intensity level mapping function.

105. (Original) The system as claimed in claim 103, wherein the plurality of discrete linear illumination intensity level mapping functions form a composite piece-wise linear illumination intensity level mapping function, the composite piece-wise linear compression being the determined illumination intensity level mapping function, the determined illumination intensity level mapping function being a nearly logarithmic illumination intensity level mapping function.

106. (Original) The system as claimed in claim 104, wherein the eight discrete linear illumination intensity level mapping functions form a composite piece-wise linear illumination intensity level mapping function, the composite piece-wise linear compression being the determined illumination intensity level mapping function, the determined illumination intensity level mapping function being a nearly logarithmic illumination intensity level mapping function.

107. (Original) A system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager, comprising:

an illumination intensity level mapping controller, operatively connected to the digital imager, to select a first illumination intensity level mapping function; and

a transfer control function generation circuit, operatively connected to the digital imager and said illumination intensity level mapping controller, to determine a first transfer control function based on the selected first compression and to impose the determined first transfer control function upon a pixel of the digital imager;

said illumination intensity level mapping controller determining a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon;

said illumination intensity level mapping controller determining an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram;

said illumination intensity level mapping controller determining a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager;

said transfer control function generation circuit determining a second transfer control function based on the determined second illumination intensity level mapping function;

said transfer control function generation circuit imposing the second determined transfer control function upon a pixel of the digital imager.

108. (Original) The system as claimed in claim 107, wherein the first illumination intensity level mapping function represents a greater compression of the resolution of the high illumination intensity levels of the scene than the second illumination intensity level mapping function.

109. (Original) A system for determining transition points between a plurality of discrete transfer control functions forming a composite transfer control function, comprising:

an exposure controller, operatively connected to the digital imager, to determine an integration time;

an illumination intensity level mapping controller, operatively connected to the digital imager, to determine an illumination intensity level mapping function; and

a transfer control function generation circuit, operatively connected to the digital imager, said exposure controller and said illumination intensity level mapping controller, to determine a composite transfer control function based on the determined integration time and determined illumination intensity level mapping function and to determine each transition point between a plurality of discrete transfer control functions from the determined integration time and the determined illumination intensity level mapping function.

110. (Original) The system as claimed in claim 109, wherein the composite transfer control function has eight discrete transfer control functions and seven transition points.

111. (Original) The system as claimed in claim 109, wherein a first transition point is equal to a difference between a maximum possible integration time and the determined integration time.

112. (Original) The system as claimed in claim 109, wherein a first transition point is equal to a difference between a possible maximum integration time and the determined integration time and a subsequent transition point is equal to a sum of all previous barrier break points and a time T_s where

T_s is equal to $((g^{n-1})/((g^{n-1}+g^{n-2}+\ldots+g^2+g+2)(g^{(p)})))*T_{int}$,

g is equal to the determined illumination intensity level mapping function,

n is equal to a total number of transition points,

p is equal to a positional number of the discrete transfer control function being calculated, and

T_{int} is equal to the determined integration time.

113. (Original) The system as claimed in claim 110, wherein a first transition point is equal to a difference between a possible maximum integration time and the determined integration time and a subsequent transition point is equal to a sum of all previous barrier break points and a time T_s where

T_s is equal to $((g^{n-1})/((g^{n-1}+g^{n-2}+\ldots+g^2+g+2)(g^{(p)})))*T_{int}$,

g is equal to the determined illumination intensity level mapping function,

n is equal to a total number of transition points,

p is equal to a positional number of the discrete transfer control function being calculated, and

T_{int} is equal to the determined integration time.